

## DRAWINGS ATTACHED

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## (54) IMPROVEMENTS IN A PIPE CONNECTION

(71) We, INDUSTRIELE ONDERNEMING WAVIN N.V., a Netherlands limited liability Company, of Hädelstraat 251, Zwolle, The Netherlands, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a pipe connection.

According to one aspect of the invention there is provided in a pipe connection, a sleeve, a pipe within the sleeve, sealing means between the sleeve and the pipe and coupling means to ensure that the connection will not disengage over a range of applied axial force, the sleeve having an internal recess shaped and dimensioned to house the coupling means in such a way that the pipe can be moved past the coupling means after being inserted through an end of the sleeve, the coupling means co-operating with the outer surface of the pipe when the sleeve and the pipe are urged away from one another so that the coupling means are retained on the pipe and become wedged between said outer surface and the wall of the recess, said sealing means comprising a sealing ring disposed between the coupling means and said end of the sleeve.

According to another aspect of the invention there is provided a pipe connection comprising a sleeve, a pair of pipe end portions each extending into one of the opposite ends of the sleeve, sealing means between the sleeve and the pipe end portions and coupling means to ensure that the connection will not disengage over a range of applied axial force, the sleeve having an internal recess extending about each pipe end portion and housing a coupling member having a screw threaded surface mating with corresponding screw threads on the associated pipe end portion, each coupling member and its recess being so relatively dimensioned that when the associated pipe end portion and the sleeve are urged away from one another the coupling member becomes wedged between the pipe end por-

tion and the wall of the recess, said sealing means comprising a sealing ring disposed axially outwardly of each coupling member.

For a better understanding of the invention reference will now be made by way of example to the accompanying drawing which is an axial sectional view of a pipe connection and in which parts A and B show different embodiments of the invention.

The pipe connection comprises a sleeve 1 of polyethylene comprising portions 2 (part A) and 2<sup>1</sup> (part B). In the portions 2 and 2<sup>1</sup> are pipe end portions 3 and 3<sup>1</sup>, respectively. In the sleeve portions 2 and 2<sup>1</sup> are frusto-conical axially outwardly tapered recesses 4 and 4<sup>1</sup> respectively housing coupling means 5 and 5<sup>1</sup>, respectively. The sleeve 1 may, however, be made of other thermoplastics material, for example, polypropylene or polyvinylchloride.

The coupling means 5 is in the form of frusto-conical split ring of polyethylene or other thermoplastics material (of the same hardness as or harder than the material of the pipe end portions and/or of the sleeve). The coupling means 5 is introduced from the free end 6 of the sleeve portion 2 into the recess 4 whereafter the pipe end portion 3 is inserted. The coupling means 5 has an inner diameter such that the end 7 of the pipe end portion 3 can pass therethrough, while the coupling means 5 is pressed, through its end wall 8, against the end wall 9 of the recess 4. The pipe end portion 3 is then retracted. The coupling means 5 being formed so as to grip the outer wall 10 of the pipe end portion 3, the coupling means 5 is carried along as the pipe end portion 3 is retracted from the portion 2 of the sleeve 1 and becomes wedged between the outer wall 10 of the pipe end portion 3 and the wall 11 of the recess 4 which tapers towards the free end 6 of the sleeve portion 2.

The surface of the outer wall 10 of the pipe end portion 3 is advantageously provided with a screw thread or ribs 14.

The outer surface 12 of the coupling means 5, which co-operates with the wall of the recess 4, is conveniently profiled being

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for example ribbed and preferably screw threaded. The inner surface 13 of the coupling means 5 is also preferably screw threaded.

5 On retracting the pipe end portion 3 from the sleeve portion 2 the screw thread or ribs 14 will contribute to the tensile strength of the pipe connection and the retention of the coupling means 5 on the pipe end portion 3.

10 Sealing rings 15 and 16, respectively, are provided in recesses 17 and 18, respectively, in the sleeve portion 2. These sealing rings serve to restrain the escape of liquid from the pipes to the exterior of the pipe connection, between the outer surface of the pipe end portion 3 and the coupling means 5 and between the outer surface of the coupling means 5 and the inner surface of the sleeve portion 2.

20 An advantage of the construction described above is that the coupling means are situated in a region where the inner and outer pressures on the pipe end portion 3 are substantially equal. This construction avoids damage to the pipe end portion, which could occur in the presence of a pressure difference between the inner and outer surfaces of the pipe end portion in the region of cooperation between coupling means 5 and the pipe end portion 3.

30 In part B of the drawing the pipe connection comprises coupling means 5<sup>1</sup> in the form of a toroidal spring 5<sup>1</sup> of helically wound metal wire. The windings of the spring 5<sup>1</sup> penetrate, where for example, the pipe end portion 3<sup>1</sup> and the sleeve 2<sup>1</sup> are of polyethylene, into the wall 19 of the recess 4<sup>1</sup>, and into the profiled wall 20 of the pipe end portion 3<sup>1</sup> to augment the tensile strength of the pipe connection. In the embodiment of part B sealing rings 15 and 16 in recess 17 and 18, respectively, are provided to the same end as in part A of the drawing.

45 In the interest of high tensile strength, at least the surfaces of the coupling means 5 and 5<sup>1</sup> are preferably made of a material which is harder than that of the surfaces of the pipe end portions to be connected.

50 The coupling means 5 may for example be made of hard polyvinylchloride when the polyethylene pipes are to be connected.

55 If desired steel sleeves 22 may be provided within the pipe end portions 3 and 3<sup>1</sup> to restrain deformation of the pipe end portions under the action of the coupling means.

60 In order to avoid symptoms of fracture, the corner 21 of the recess 4 and the corner 21<sup>1</sup> of the recess 4<sup>1</sup> are rounded. The end walls 9 and 9<sup>1</sup> should be constructed in such a way that upon inward movement of the pipe end portions, the coupling means 5 and 5<sup>1</sup> are retained with respect to the pipe end portions.

The sleeve 1, as shown in the drawing, is provided with a central internal abutment 23. However, the abutment 23 may be omitted and the pipe end portions 3 and 3<sup>1</sup> may have smooth outer surfaces extending some distance back from the ends 7 and 7<sup>1</sup>, respectively. After the pipe end portion 3 has been secured in the sleeve, but before the pipe end portion 3<sup>1</sup> has been inserted, the pipe end portion 3 can be released by pulling the coupling means 5 towards the wall 9 by means of a tool (not shown) inserted through the sleeve portion 2<sup>1</sup>.

80 The coupling means 5 may consist of metal which is in some cases preferable where thermoplastics pipes are used. The coupling means may for example comprise plastics rings made for example of hard polyvinylchloride provided with a hard metal surface, which may be profiled to improve the tensile strength of the pipe connection.

90 For the removal of the pipe end portions 3 or 3<sup>1</sup> from the sleeve 1, the coupling means 5<sup>1</sup> may be shaped similarly to the coupling means 5, the whole of the outer surface 13 of pipe end portion 3 being provided with right handed screw threads and the whole of the outer surface of pipe end portion 3<sup>1</sup> being provided with left handed screw threads or vice versa, the said screw threads of the two pipe end portions being of equal pitch. The surfaces of the coupling means which surfaces cooperate with the outer surfaces of the pipe end portions 3 and 3<sup>1</sup> have in this case screw threads adapted to the screw threads of the pipe end portions 3 and 3<sup>1</sup>. The abutment 23 is omitted.

105 The pipe coupling being constructed as just described, the sleeve 1 can be screwed to the left or to the right by virtue of the cooperating screw threads until the pipe end portion 3 or 3<sup>1</sup> as the case may be is completely free of the sleeve 1. Such pipe end portion can now be removed and the connection can be subsequently restored by screwing the sleeve 1 in the opposite direction.

115 The sleeve 1 may be formed as a part of one of the pipe end portions, so as in effect to provide a female pipe end. In this case, of course, no means are required for coupling the one pipe end portion to the sleeve.

120 The coupling means 5 may be profiled so as to provide pin shaped projections for cooperation with the corresponding pipe end portion.

125 In the embodiments described above, the coupling means will be in any event such as to ensure that the pipe connection will not disengage over a range of applied axial force.

## WHAT WE CLAIM IS:—

1. In a pipe connection, a sleeve, a pipe within the sleeve, sealing means between the sleeve and the pipe and coupling means to ensure that the connection will not disengage over a range of applied axial force, the sleeve having an internal recess shaped and dimensioned to house the coupling means in such a way that the pipe can be moved past the coupling means after being inserted through an end of the sleeve, the coupling means co-operating with the outer surface of the pipe when the sleeve and the pipe are urged away from one another so that the coupling means are retained on the pipe and become wedged between said outer surface and the wall of the recess, said sealing means comprising a sealing ring disposed between the coupling means and said end of the sleeve.
2. A pipe connection as claimed in claim 1, in which the pipe has an internal steel tube to restrain deformation of the pipe under the action of the coupling means.
3. A pipe connection as claimed in claim 1 or 2, in which the sleeve is formed as part of a pipe end.
4. A pipe connection as claimed in claim 1, 2 or 3, in which surface of the coupling means which surface co-operates with the pipe is at least as hard as the co-operating surface of the pipe.
5. A pipe connection as claimed in any one of the preceding claims, in which the coupling means consists of a helically wound toroidal spring.
6. A pipe connection as claimed in any one of claims 1 to 4, in which the coupling means consists of a frusto-conical split ring.
7. A pipe connection as claimed in any one of claims 1 to 4 or 6, in which the coupling means has a profiled gripping surface engaging the pipe.
8. A pipe connection as claimed in any one of the preceding claims, in which a part of the outer surface of the pipe is profiled.
9. A pipe connection as claimed in any one of claims 1 to 4, in which the coupling means has a screw threaded inner surface which co-operates with a correspondingly screw threaded outer surface of the pipe.
10. A pipe connection comprising a sleeve, a pair of pipe end portions each extending into one of the opposite ends of the sleeve, sealing means between the sleeve and the pipe end portions and coupling means to ensure that the connection will not disengage over a range of applied axial force, the sleeve having an internal recess extending about each pipe end portion and housing a coupling member having a screw threaded surface mating with corresponding screw threads on the associated pipe end portion, each coupling member and its recess being so relatively dimensioned that when the associated pipe end portion and the sleeve are urged away from one another the coupling member becomes wedged between the pipe end portion and the wall of the recess, said sealing means comprising a sealing ring disposed axially outwardly of each coupling member.
11. A pipe connection as claimed in claim 10, in which the screw threads of the pipe end portions are of opposite hand and of equal pitch, the sleeve being screwable along the pipe end portions in either axial direction thereof to release a pipe end portion from the sleeve.
12. A pipe connection as claimed in any one of the preceding claims, in which the or each recess tapers frusto-conically axially outwardly of the sleeve.
13. A pipe connection as claimed in any one of the preceding claims, in which the sleeve and the or each pipe, or the sleeve or the or each pipe consists of polyethylene or polypropylene.
14. A pipe connection substantially as hereinbefore described with reference to the accompanying drawing.

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